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(54) METHODE ET DISPOSITIF DE REMPLISSAGE D'UN FOSSE
(54) TRENCH-FILLING METHOD AND DEVICE

(57)

A method for filling a trench (14), involving (i) towing with the aid of a hydraulic shovel (1) parallel to trench (14) a frame (3) mounted on wheels or crawlers (4) which supports a loading hopper (12) fitted with a grid (16) in the bottom; (ii) filling the said hopper (12) with filling material with the aid of hydraulic shovel (1); (iii) transferring the filling material by gravity through grid (16) onto a vibrating screen installed beneath hopper (12), and then onto a continuous conveyor (17) installed beneath the vibrating screen on frame (3), transversely to its direction of movement, the vibrating screen and the conveyor being driven by motor systems fitted to the frame; and (iv) tipping the backfill material laterally into trench (14) with the aid of the conveyor.

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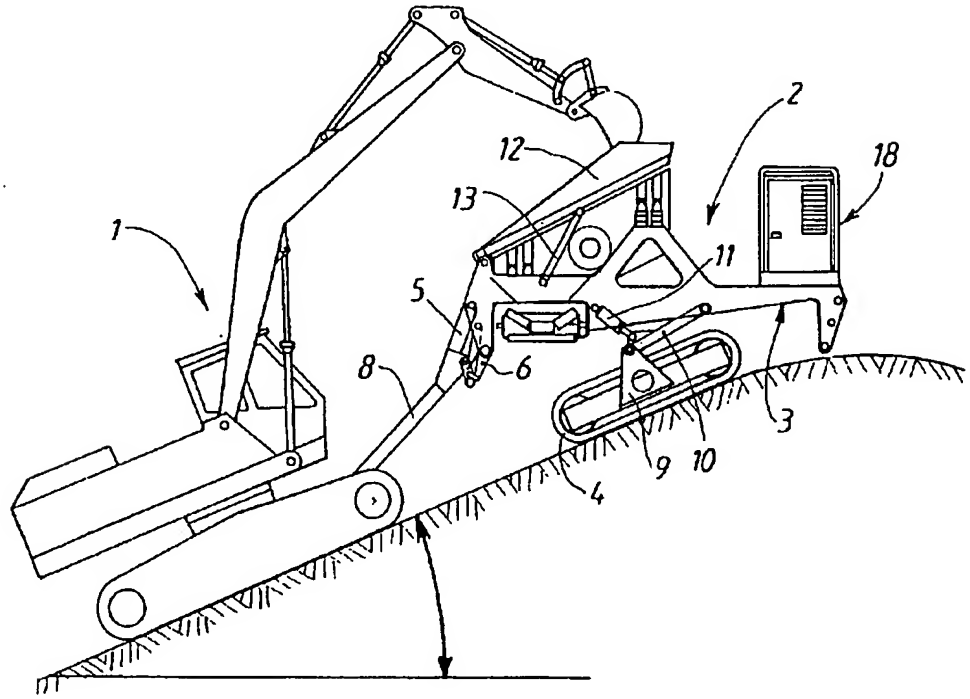
(54) **METHODE ET DISPOSITIF DE REMPLISSAGE D'UN FOSSE**
(54) **TRENCH-FILLING METHOD AND DEVICE**



(57) A method for filling a trench (14), involving (i) towing with the aid of a hydraulic shovel (1) parallel to trench (14) a frame (3) mounted on wheels or crawlers (4) which supports a loading hopper (12) fitted with a grid (16) in the bottom; (ii) filling the said hopper (12) with filling material with the aid of hydraulic shovel (1); (iii) transferring the filling material by gravity through grid (16) onto a vibrating screen installed beneath hopper (12), and then onto a continuous conveyor (17) installed beneath the vibrating screen on frame (3), transversely to its direction of movement, the vibrating screen and the conveyor being driven by motor systems fitted to the frame; and (iv) tipping the backfill material laterally into trench (14) with the aid of the conveyor.

ABSTRACT

A method for filling a trench (14), involving (i) towing with the aid of a hydraulic shovel (1) parallel to trench (14) a frame (3) mounted on wheels or crawlers (4) which supports a loading hopper (12) fitted with a grid (16) in the bottom; (ii) filling the said hopper (12) with filling material with the aid of hydraulic shovel (1); (iii) transferring the filling material by gravity through grid (16) onto a vibrating screen installed beneath hopper (12), and then onto a continuous conveyor (17) installed beneath the vibrating screen on frame (3), transversely to its direction of movement, the vibrating screen and the conveyor being driven by motor systems fitted to the frame; and (iv) tipping the backfill material laterally into trench (14) with the aid of the conveyor.

TRENCH-FILLING METHOD AND DEVICE

This invention relates to a trench-filling method and a device designed to implement the said method.

Pipelines are used to transport fluids such as gas or oil over long distances, and are generally protected by burying them in trenches. These trenches are usually filled with screened backfill, and for this purpose a screening and filling device is generally used which is fitted laterally to a tractor that moves along the trench.

A screening and filling device of this kind usually comprises a hopper designed to receive the materials used for filling, a continuous conveyor installed below the hopper, and a system of vibrating screens fed by the continuous conveyor which fill the trench with successive layers of material with a given particle size. The assembly is integral with a frame which is suspended over the trench to be filled by the carrying arm of a tractor or similar device. A trench can thus be filled with different layers of the same material or materials with different particle sizes, possibly by making a number of runs with the device.

A device of this kind is described in detail, for example, in US patent no. 4 955 756, but numerous variations also exist on the market; the Applicant itself has designed various improvements to a device of this kind, which are described in its European patent application no. 0 709 526.

These devices are wholly satisfactory, but relatively expensive because they are self-propelled.

The frame also presents the drawback that it is suspended from the

tractor.

Finally, the hopper must be filled with the backfill material with the aid of a device independent of the filling system.

To remedy these drawbacks, this invention does not use a self-propelled filling system but a screening and filling system towed by a hydraulic shovel of conventional type which also fills the screening device with filling material, in which the hydraulic shovel/screening device assembly can move either along the spoil ridge alongside the trench or along a track laid on the other side of the trench.

The invention therefore relates primarily to a method for filling a trench, specifically with the spoil excavated from the said trench; the said method involves (i) towing parallel to the trench, with the aid of a hydraulic shovel, a frame mounted on wheels or crawlers which supports a filling hopper fitted with a grid at the bottom; (ii) filling the said hopper with filling material with the aid of the hydraulic shovel; (iii) transferring the filling material through the grid by gravity onto a vibrating screen installed under the hopper, then onto a continuous conveyor installed under the vibrating screen on the frame, transversely to its direction of movement, the vibrating screen and the conveyor being driven by motor systems fitted to the frame; and (iv) tipping the filling material laterally into the trench with the aid of the conveyor.

The invention also relates to a device suitable for towing destined to be used in the method described above, which screens filling material and tips it into a trench, the said device being characterised in that it comprises:

- a frame mounted on wheels or crawlers and fitted with at least one coupling connecting it to a hydraulic shovel suitable to tow it
- a filling hopper for backfill material, fitted with a grid in the bottom, mounted on the said frame
- a vibrating screen below the said grid
- a continuous conveyor below the said vibrating screen, one end of which said conveyor projects laterally from the said frame
- and systems fitted to the said frame which drive the vibrating screen and conveyor.

The coupling that connects the frame to the hydraulic shovel can be a simple tow-bar jointed at one end to the frame and at the other end to the hydraulic shovel.

The hopper is preferably mounted so that it swivels in relation to the frame, at least one cylinder being fitted to the frame to straighten the hopper by swivelling it in relation to the frame, in order to discharge the largest parts of the filling material which do not pass through the grid.

The grid can be constituted by simple parallel bars, which could be installed, for example, parallel to the direction of movement of the device.

The conveyor is preferably installed transversely to the direction of movement of the frame under the action of the hydraulic shovel with which it is integral. This conveyor can advantageously traverse under the action of a dual-action cylinder, so that it can project as required from either the left- or the right-hand side of the device. In addition, it is driven by at least one reversing motor, such as a hydraulic motor, so that it can tip the filling material to the right or left of the device.

Finally, the invention relates to a trench-filling assembly characterised in that it comprises a hydraulic shovel and a device for screening and tipping filling material of the type described above, the said device being connected to the hydraulic shovel by a coupling such as a tow-bar, so that it can be towed by the shovel.

The frame of the screening device will preferably be fitted at both ends with systems that allow it to be coupled to the hydraulic shovel, so that it can be towed from either end.

Other characteristics and advantages of the invention will appear more clearly from the following detailed description of a form of embodiment thereof. The said description will refer to the annexed schematic drawings in which:

- Figure 1 is a lateral elevation of an assembly constituted by a hydraulic shovel and a screening and filling device towed by the said shovel, the said assembly being shown in a position in which the shovel is moving down a slope
- Figure 2 is a similar view to figure 1, shown in a position in which the shovel is moving uphill
- Figure 3 is a cutaway view from above of the screening and filling device towed by the hydraulic shovel
- Figure 4 shows the position of the said screening and filling device on uneven ground, in a lateral position in relation to the trench to be filled

In these drawings, the self-propelled hydraulic shovel is marked 1, while the screening and filling device towed by the said shovel is marked 2.

Shovel 1 can be of any known type.

Device 2 comprises a frame 3, shown here mounted on crawlers 4, although it could equally well be mounted on wheels; a tow-bar 8 is jointed at one end by levers 5 and 6 to the said frame 3, and at the other end to the frame of shovel 1.

Lever 6 is attached to the stem of a cylinder 7 fitted to frame 3 of the screening and filling device.

The said frame 3 is connected to structure 9, fitted with crawlers 4, by a system of levers such as 10 which are activated by a cylinder 11, so that they can maintain the frame in the horizontal position whatever the slope of the terrain on which crawlers 4 rest.

A hopper 12, one end of which, adjacent to shovel 1, is fitted so that it swivels in relation to frame 3 under the action of cylinders 13, receives the raw materials destined to fill trench 14 from shovel 1 (see figure 4), for example in order to bury a pipe 15 which has been laid in the said trench.

The filling materials are usually constituted by backfill from trench 4, and it is advisable to screen them before using them to fill the trench. For this purpose, hopper 12 comprises a base constituted by a grid 16, here constituted by parallel bars arranged longitudinally which are designed to trap excessively large spoil, which can subsequently be discharged by raising the hopper (see figure 2).

The material which passes through the grid falls onto a vibrating screen 19 installed below the grid, then onto a continuous conveyor 17 which is fitted to frame 3 beneath the vibrating screen and installed transversely to the direction of movement of the said frame.

The said conveyor 17 projects laterally from the frame above trench 14,

and tips the backfill material into it. Conveyor 17 is driven by two reversing hydraulic motors fitted to frame 3. As described above, it can also be moved transversely with the aid of a double-action cylinder so as to project laterally from either side of the frame, so that the backfill material can be tipped either to the left or the right of the said frame.

The various cylinders in the screening and filling device and the motors that drive conveyor 17 and the vibrating screen are powered and activated by a hydraulic unit 18 fitted to frame 3. All these parts are controlled from a distance by a remote control in the cab of the hydraulic shovel, or activated by an operator at the control panel.

The invention consequently offers a simple, inexpensive means of filling trenches, because the trench-filling device is not self-propelled but towed by a hydraulic shovel, which also serves to feed the filling device with backfill material.

Both ends of frame 3 are more or less identical, so that screening device 2 can be coupled to hydraulic shovel 1 by either of the said ends in order to be towed by it.

As will be seen from figure 4, the crawlers of the screening and filling device can adapt to very uneven terrain, and advance, for example, on spoil ridge 20 of trench 14 or on a track 21 laid on the other side of the said trench.

As will also be seen from figures 1 and 2, the hydraulic shovel/screening and filling device assembly is able to move up or down relatively steep slopes, with an inclination of up to 25 degrees.

CLAIMS

1) Method for filling a trench (14), specifically with backfill material excavated from the same trench, which said method involves (i) towing with the aid of a hydraulic shovel (1) parallel to trench (14) a frame (3) mounted on wheels or crawlers (4) which supports a loading hopper (12) fitted with a grid (16) in the bottom; (ii) filling the said hopper (12) with filling material with the aid of hydraulic shovel (1); (iii) transferring the filling material by gravity through grid (16) onto a vibrating screen installed beneath hopper (12), and then onto a continuous conveyor (17) installed beneath the vibrating screen on frame (3), transversely to its direction of movement, the vibrating screen and the conveyor being driven by motor systems fitted to the frame; and (iv) tipping the backfill material laterally into trench (14) with the aid of the conveyor.

2) Device suitable to be towed, designed for screening filling material and tipping it into a trench (14), and destined to be used in the method according to claim 1, the said device being characterised in that it comprises:

- a frame (3) mounted on wheels or crawlers (4) and equipped with at least one coupling (8) which connects it to a hydraulic shovel suitable to tow it
- a filling material loading hopper (12) on the said frame, the said hopper being fitted with a grid (16) at the bottom
- a vibrating screen (19) below grid (16)
- a continuous conveyor (17) below the said vibrating screen, one end of which conveyor projects laterally from frame (3)

- and systems designed to drive the said vibrating screen and conveyor (17), which said systems are fitted to the frame.

3) Device as claimed in claim 2, characterised in that conveyor (17) can traverse under the action of a dual-action cylinder, so that it can project from either side of frame (3).

4) Device as claimed in claim 3, characterised in that conveyor (17) is driven by a reversing motor.

5) Device as claimed in any of claims 2 to 4, characterised in that the coupling which connects the frame to the hydraulic shovel is a tow-bar (8) jointed to frame (3), the position of which said tow-bar can be adjusted with the aid of control systems (5, 6, 7) such as levers and cylinders.

6) Device as claimed in any of claims 2 to 5, characterised in that the frame is fitted at both ends with a system which makes it integral with a coupling (8) that connects it to the hydraulic shovel.

7) Device as claimed in any of claims 2 to 6, characterised in that the hopper (12) is fitted to swivel in relation to frame (3) under the action of control systems such as at least one cylinder.

8) Unit designed to fill a trench (14), characterised in that it comprises a hydraulic shovel (1) and a screening and backfill tipping device (2) as claimed in any of claims 2 to 7, the said device (2) being coupled to the hydraulic shovel by means of a connector such as a tow-bar (8), so that it can be towed by shovel (1).

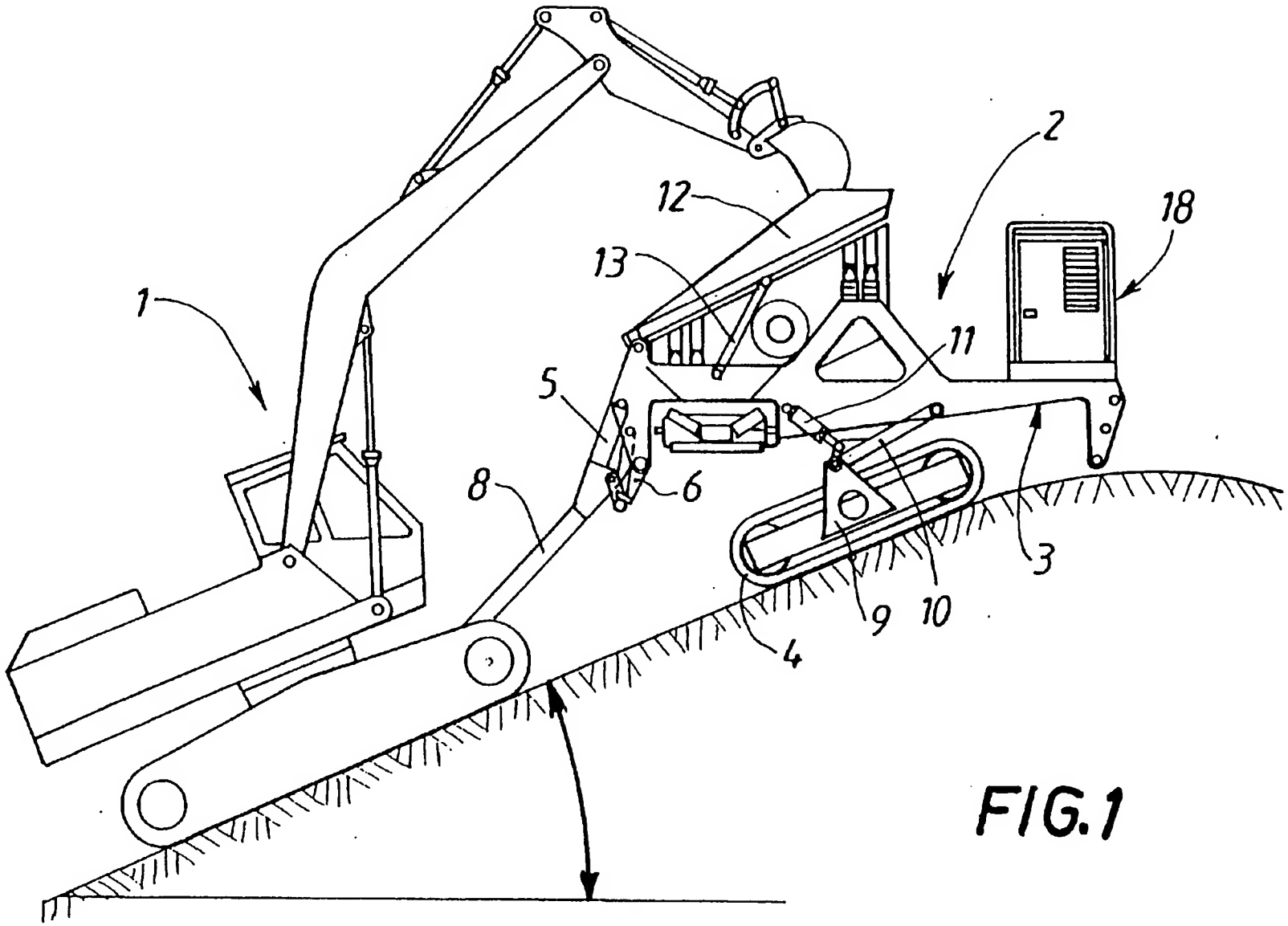


FIG.1

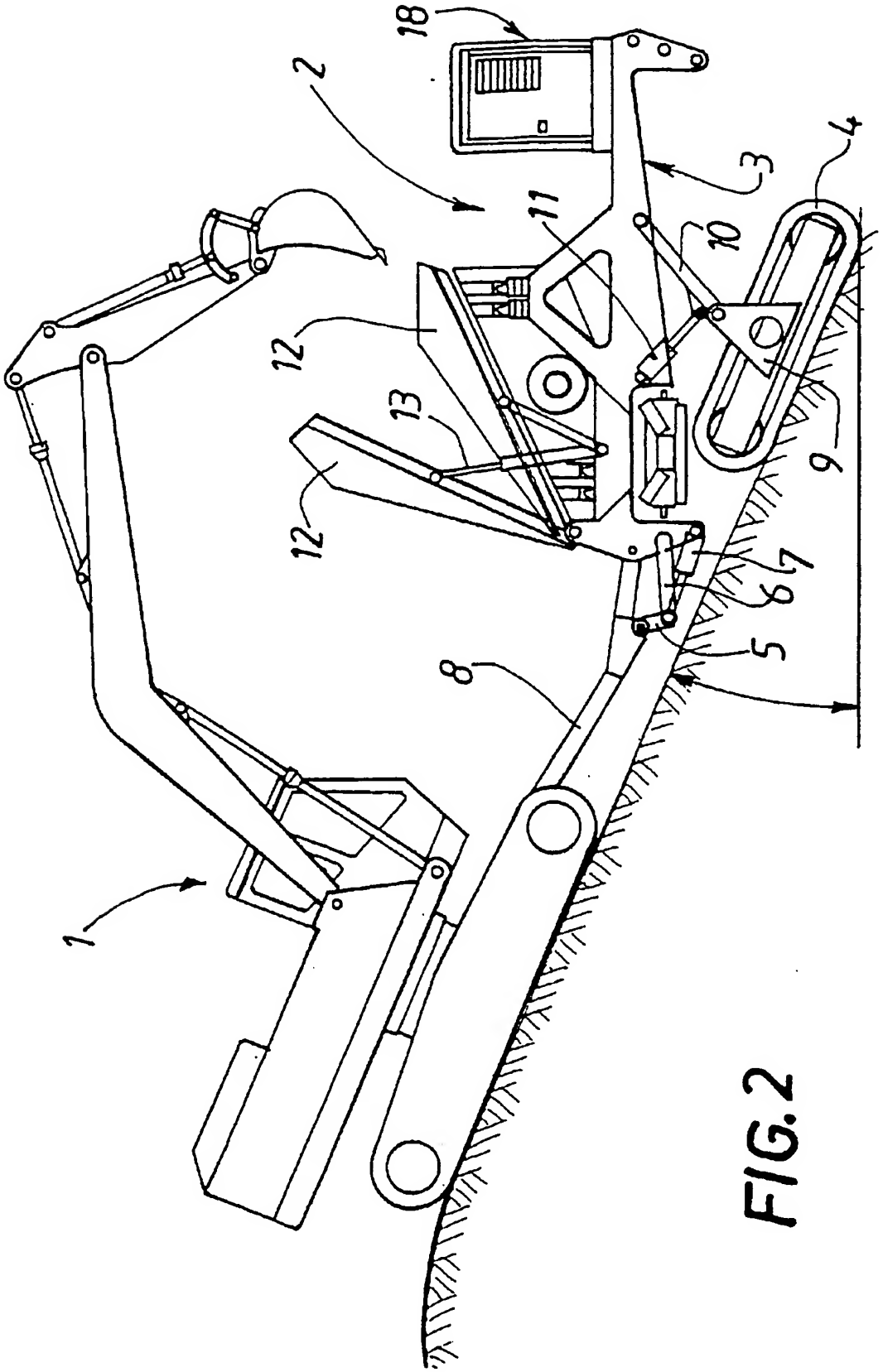


FIG.2

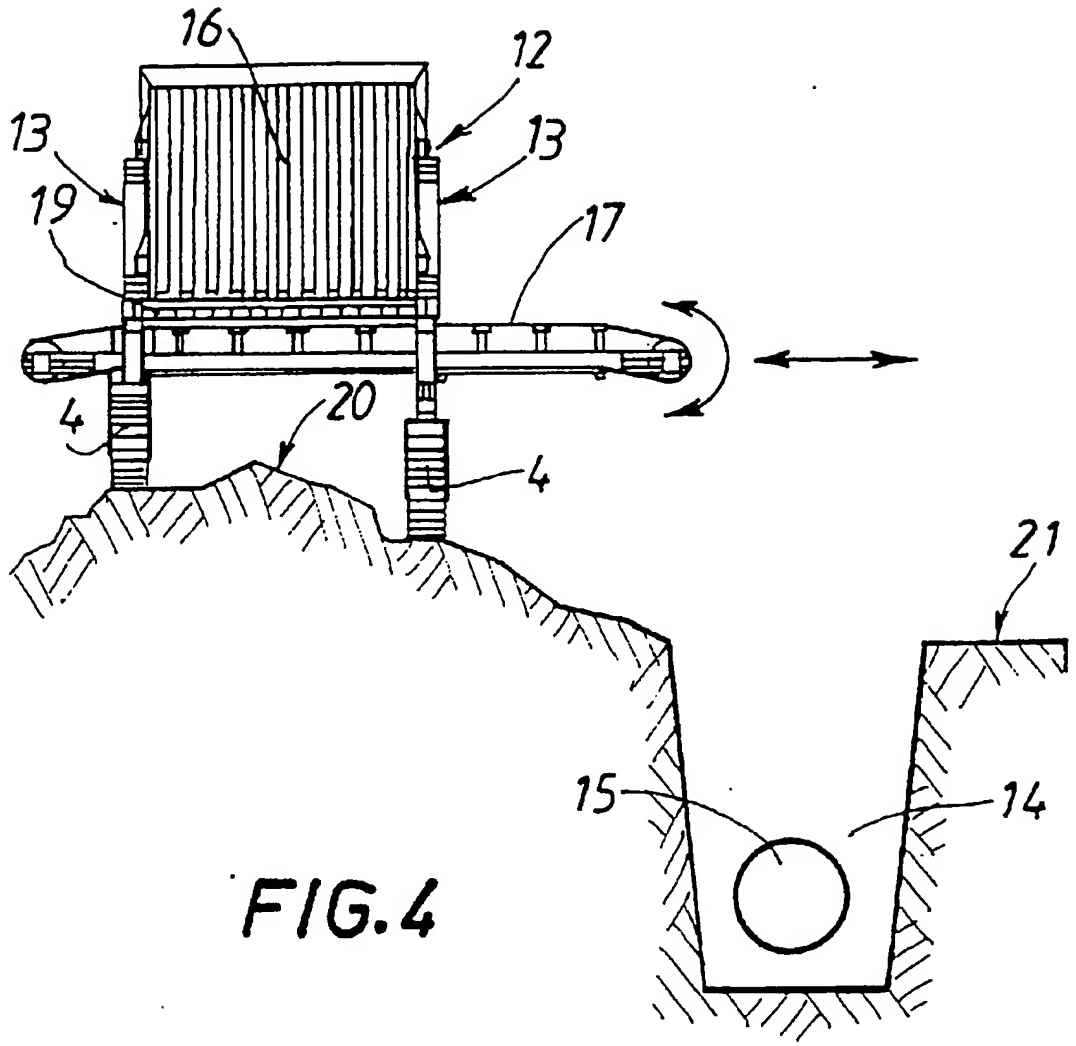


FIG. 4

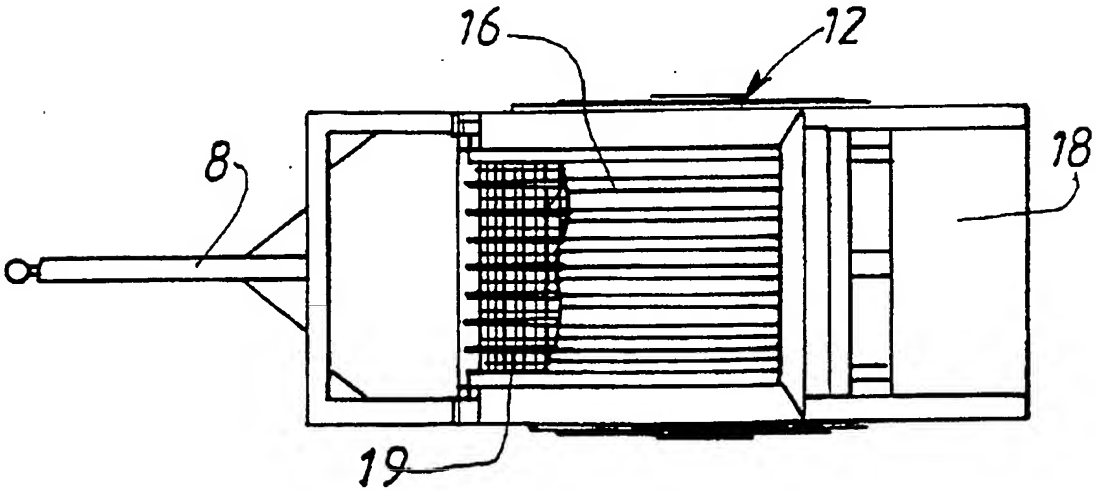


FIG. 3